

REMARKS

Claim 2 has been cancelled. New claims 7-16 have been added and are directed to the subject matter of original claim 2, specifically combinations of pH value, particle polarity, and metal-oxides. Claims 1 and 6 has been amended. No new matter has been added.

Claim Rejections – 35 U.S.C. § 112

Claim 2 has been rejected under 35 U.S.C. 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter. Specifically, the Examiner asserts that claim 2 is unclear and should not be written in table form. In response, claim 2 has been cancelled and its subject matter is now recited in new claims 7-16.

Claim 6 has been rejected under 35 U.S.C. 112, second paragraph, as unclear. Applicant has amended claim 6. Amended claim 6 is directed to a system for cross-flow filtration of suspension of particles comprising a filter membrane having a Zeta potential with the same sign of polarity as the particles at the pH value of the aqueous suspension during filtration. This language precisely defines the present structural attributes of the system. Therefore, this rejection is overcome and should be withdrawn.

Claim Rejections – 35 U.S.C. § 102

Claim 6 has been rejected under 35 U.S.C. 102(b) as anticipated by Gan et al. (Beer Clarification by Cross-flow Microfiltration). A comparison of Gan et al. to amended claim 6 demonstrates that Gan et al. does not contain every element of the claimed invention, and thus Applicant respectfully traverses this rejection.

Applicant's amended claim 6 is directed to a system for cross-flow microfiltration of a suspension of particles wherein the Zeta potential of the filter membrane layer has the same sign of polarity as the particles. Gan et al., however, does not disclose this critical limitation. Gan et al. discloses a study of beer filtration fouling mechanisms and flux enhancement. Gan's studies involve the effects of treating beer with enzymes, varying the pressure and creating flow pulsation, altering pore size, and using backflush. Gan et al. does not disclose or suggest that the Zeta potential of the filter membrane has the same sign of polarity as the particles.

According to the Office Action, the charge of Zeta potential "seems to be inherent of the membrane material." Office Action at 3. However, a filter membrane does not inherently have the same sign of polarity as the particles to be retained. The Zeta potential of the membrane material depends on the pH value of the solution. There is no factual basis for the Examiner's conclusion that the Zeta potential of the membrane material disclosed in Gan et al. has the same sign of polarity as the particles to be retained, as claimed by the Applicant.

Similarly, claim 6 was rejected as anticipated by GB 2176715A (the "GB '715 application"), which discloses an apparatus for filtering beer by a cross-flow filtration process involving ceramic membranes. Applicant respectfully traverses this rejection. As the Examiner states, "The Zeta potential is not discussed in the reference, however, seem to be inherent of the membrane material." Office Action at 3. The GB '715 application clearly does not disclose Zeta potential or polarity either for the membrane filter or the particles to be retained, and there is no factual basis for the Examiner's conclusion that the GB '715 patent application discloses a membrane filter having a Zeta potential with the same sign of polarity as the particles to be retained.

Claim Rejections – 35 U.S.C. § 103

Claims 1-6 have been rejected under 35 U.S.C. 103(a) as being obvious over Burrel et al. (Crossflow Microfiltration of Beer; Laboratory-Scale Studies on the Effect of Pore Size) or Burrel et al. in view of Goldsmith et al. (U.S. Patent No. 5,114,581). Applicant respectfully traverses this rejection.

Claim 1 recites a method for the removal of particulate matter from aqueous suspension comprising, among other things, the following steps: (1) establishing the pH value of the suspension and the Zeta potential of particles in the suspension; and (2) providing a porous ceramic filter having a membrane layer consisting of at least a metal-oxide with a Zeta potential at the pH value of the suspension having the same polarity of the Zeta potential as the particles in the suspension. Nothing in Burrel discloses or suggests these steps of the present invention. Burrel merely discloses studies concerning the effect of pore size on ceramic cross-filtration. Specifically, Burrell conducted studies on various sizes of ceramic cross-flow filter membranes manufactured by Ceramem Corp.

The Examiner states that “[t]he pH and Zeta potential factors are not disclosed by Burrel et al, however, this property seems to be inherent of the particular ceramic materials claimed” Office Action at 4. As discussed above, the Zeta potential of the membrane is dependent on the pH value, and the membrane does not inherently have the same sign of polarity as the Zeta potential of the particles to be retained. There is no disclosure or suggestion (inherent or otherwise) in Burrel that the filter membrane and particles have Zeta potentials with the same sign of polarity, as expressly recited in claim 1.

Claims 3-5 depend from claim 1 and therefore are not obvious over Burrel for the same reasons discussed with respect to claim 1. Amended claim 6 is directed to a filtration system where the Zeta potential of the filter membrane layer has the same sign of polarity as the particles to be retained. As discussed above, this feature is not disclosed or suggested in Burrel.

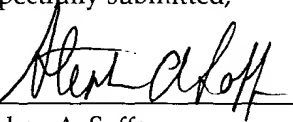
Furthermore, Goldsmith does not overcome the deficiencies of Burrel. According to the Office Action, Goldsmith discloses the membrane module made of ceramic support and ceramic layer, which "inherently possesses the Z potential and properties claimed. . . ." Office Action at 4. However, as stated above, while a ceramic filter may possess a Zeta potential, it does not inherently have the same sign of polarity as the Zeta potential of the particles.

Claims 1, 2, and 3 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Galaj et al (U.S. Patent No. 4,946,592). According to the Office Action, Galaj discloses a microfiltration membrane composite made of ceramic or metal oxides. However, as with the other cited references, the Examiner concedes that "[t]he pH, and the membrane potential are not disclosed in reference '592.'" Office Action at 5. The Examiner asserts that one skilled in the art would have expected the same membrane performance as Applicant's invention based on the membrane materials. However, Applicant's invention includes the critical step of having the Zeta potential of the filter membrane the same sign of polarity as the Zeta potential of the particles to be retained. This step is not disclosed or suggested in Galaj.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. According, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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